

# National 3 – Dynamics and Space

## 1. Forces

A force pushes or pulls on something. There are 3 things that forces can do:

- Change the speed of an object (cause it to accelerate or slow down)
- Change the direction of an object
- Change the shape of an object

We meet different types of forces. For example...

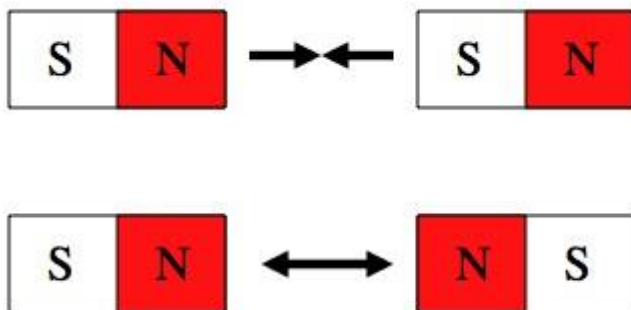
### Magnetic Forces

Magnets exert a force on each other and on some metals like iron.

Magnets have a North and a South pole.

Two North poles will repel each other and two South poles will repel each other.

BUT a North and South pole will attract each other.



### Gravity

All mass in the universe pulls on all other mass. This effect is usually very weak but near large objects like planets the gravitational pull means things fall towards their surface.

The force due to gravity on an object is called its weight. This is different from its mass.

On the same planet all things should fall at the same rate but in real life air friction can affect this. This is why we can use parachutes to slow the rate at which things fall.

## Friction

Friction always acts against motion. It can be caused by two surfaces rubbing against each other but even air passing over an object will cause friction. Sometimes this can generate heat.

If no force acts on an object it will stay at the same speed forever. Without friction objects are less likely to slow down and will move much more easily.

If an object passes over a rough surface it will slow down because of friction. An object passing over sandpaper will slow down much more quickly than an object passing over a polished surface.

Sometimes friction is useful. For example:



- Parachutes – The larger the parachute the greater the air friction. This will mean objects fall much more slowly.

- Brakes: These use friction to slow or stop vehicles.
- Tyres: These are used to provide friction between the car and the road. Wider tyres will have more friction. On wet roads friction will be reduced and it will be harder to stop.



Usually we try to reduce friction. For example:

- We make cars more streamlined to reduce air friction
- We use lubricants like oil to reduce friction on engine parts or bike chains.
- Athletes wear tight fitting clothing to reduce air friction and help them go faster.
- Skiers wax their skis to reduce friction between the skis and the snow.
- Air tables use a cushion of air to reduce friction between objects and the table.

## 2. The Solar System

### Planets

The eight planets in the Solar System, starting with the nearest to the Sun are:

**Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune**

Jupiter is the largest planet.

### Other objects in the solar system

The Solar System also contains **dwarf planets**. **Pluto** is a dwarf planet.

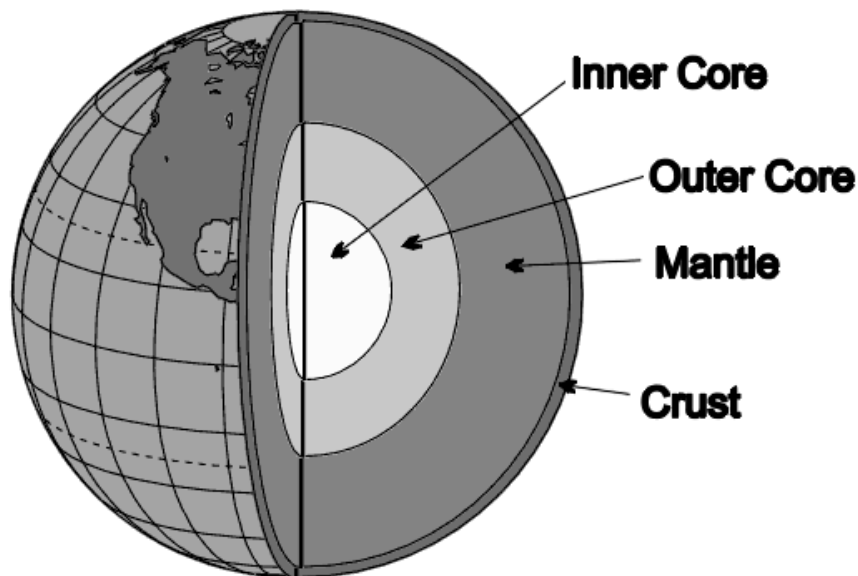
Between Mars and Jupiter there is also an **asteroid** belt. Inside the belt there is another dwarf planet called Ceres.

There are also **comets** – small, icy objects which travel through the Solar System

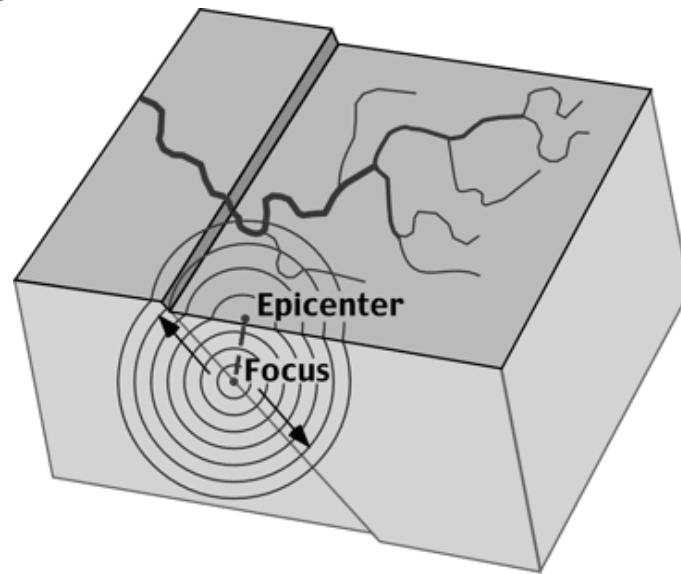
Sometimes rocks from space are found on Earth after they have fallen from the sky. These are called **meteorites**.

### The Earth

You need to know the basic structure of the Earth

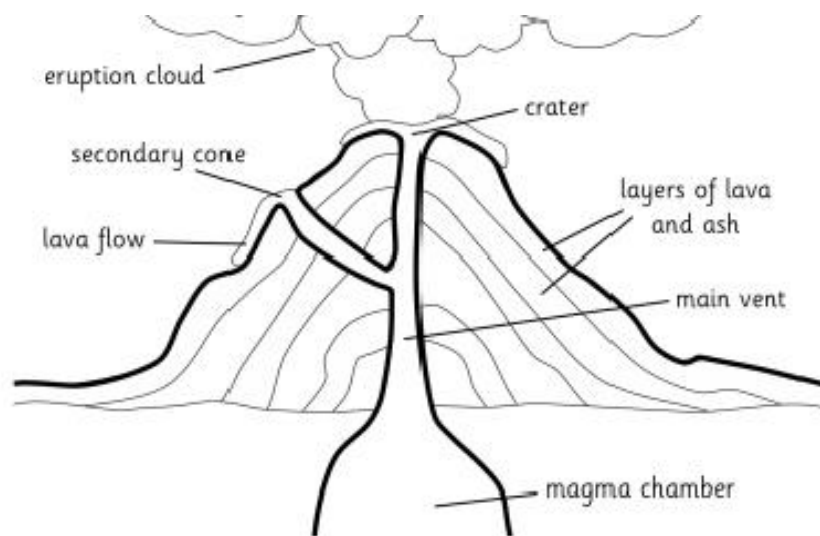


## Earthquakes



When two tectonic plates move past each other they can stick, then slip. This results in a release of energy and can cause an earthquake.

## Volcanoes



Sometimes when there is an opening in the Earth's crust hot lava, ash and gas can escape from below the surface.

## Climate Change

The Earth's climate has changed over time. We now think that human activities are causing climate change. This is partly due to the burning of fossil fuels. This releases carbon dioxide (CO<sub>2</sub>) into the atmosphere which then traps heat, causing the Earth's temperature to rise.

## The Earth, the Moon and the Sun

### The Moon

The Moon orbits the Earth. It does not give out light. It is bright because it reflects light from the Sun.

### Days, Months and Years

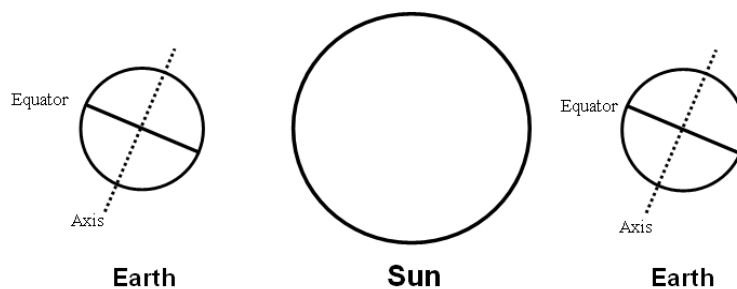
The Earth spins once every 24 hours. This gives us the definition of one day.

The Earth orbits (goes around) the Sun once every 365 days. This gives us the definition of a year.

The Moon orbits (goes around) the Earth every 28 days. This is approximately once each month. This is called a lunar month.

### Seasons and Tides

The Earth has seasons because it is tilted on its axis.



Tides are caused by the Moon. The gravitational field of the Moon pulls on the oceans, making them rise at different times of day on different parts of the Earth. The Sun also has a similar effect but this is much smaller.

### Eclipses

Sometimes the Moon is directly between the Earth and the Sun. This is known as an eclipse and can mean that the light from the Sun is blocked out.

